

## Claims

- [1] A filter matrix substantially overlying cooking equipment at a selective distance therefrom for reducing volatile particulate matter and organic compounds in cooking smoke, said filter matrix comprising:
- at least one filter screen layer, said at least one filter screen layer being flat and having a plurality of pre-determined apertures defined therein arranged in an array for the passage of cooking smoke therethrough, and wherein each of said apertures is diamond shaped; and
  - a stack of at least two expanded metal filter layers, the first of which is contiguous to said filter screen layer, each of said expanded metal filter layers having a plurality of predetermined apertures defined therein arranged in an array for the passage of cooking smoke therethrough ;
  - wherein each of said apertures in each of said expanded metal filter layers is diamond-shaped defined by four walls which are inclined at an angle to a plane defined by the expanded metal filter layers; and
  - wherein each of said expanded metal filter layers has a major axis and a minor axis such that when said expanded metal filter layers are stacked, said major axis of one of said expanded metal filter layers is perpendicular to the major axis of the next adjacent expanded metal filter layer:
  - whereby when the cooking smoke is passing through said filter matrix, the pathway of the cooking smoke is labyrinthine.
- [2] The filter matrix according to claim 1, wherein said four walls defining each of said apertures in each of said expanded metal filter layers is inclined at an angle between 30 to 70 degrees.
- [3] The filter matrix according to claim 1, wherein said filter screen layer is manufactured from steel.
- [4] The filter matrix according to claim 1, wherein said expanded metal filter layer is manufactured from materials chosen from the group of materials consisting of iron, chromium, aluminum, yttrium, zirconium, titanium dioxide and combinations and mixtures thereof.
- [5] The filter matrix according to claim 1, wherein said filter screen layer has a catalytic coating thereon.
- [6] The filter matrix according to claim 5, wherein said catalytic coating is a precious metal catalyst.
- [7] The filter matrix according to claim 5 wherein said catalytic coating is titanium dioxide.
- [8] The filter matrix according to claim 1, wherein said expanded metal filter layer has a catalytic coating thereon.
- [9] The filter matrix according to claim 8, wherein said catalytic coating is a precious metal catalyst.

- [10] The filter matrix according to claim 8 wherein said catalytic coating is titanium dioxide.
- [11] The filter matrix according to claim 1, wherein said filter screen layer has an electropolished surface.
- [12] The filter matrix according to claim 1, wherein said filter screen layer has a non-stick coating.
- [13] The filter matrix according to claim 1, wherein said expanded metal filter layer has an electropolished surface.
- [14] The filter matrix according to claim 1, wherein said expanded metal filter layer has a non-stick coating .
- [15] The filter matrix according to claim 1, wherein each of said filter screen layers has a porosity between 50% and 70% .
- [16] The filter matrix according to claim 1, wherein each of said filter screen layers has a porosity between 60% and 65% .
- [17] The filter matrix according to claim 1, wherein each of said filter screen layers has a porosity of 62% .
- [18] The filter matrix according to claim 1, wherein each of said expanded metal filter layers has a porosity of between 30% and 50%.
- [19] The filter matrix according to claim 1, wherein each of said expanded metal filter layers has a porosity of between 40% and 55%.
- [20] The filter matrix according to claim 1, wherein each of said expanded metal filter layers has a porosity of 42%.
- [21] The filter matrix according to claim 1, wherein said filter matrix functions from a range of 300°F to 1100°F at a ventilation rate of 50 to 3600 feet per minute.
- [22] The filter matrix according to claim 1, wherein a stack of at least two expanded metal filter layers is sandwiched between two said filter screen layers.
- [23] The filter matrix according to claim 1, wherein said filter matrix is mounted in a frame.
- [24] A filter matrix structure substantially overlying cooking equipment at a selective distance therefrom for reducing volatile particulate matter and organic compounds in cooking smoke, said filter matrix structure comprising:
  - at least one filter matrix having:
    - a stack of at least two expanded metal filter layers, each of said expanded metal filter layers having a plurality of predetermined apertures defined therein arranged in an array for the passage of cooking smoke therethrough;
    - wherein each of said apertures in each of said expanded metal filter layers is diamond-shaped defined by four walls which are inclined at an angle to a plane defined by the expanded metal filter layers;
    - wherein each of said expanded metal filter layers has a major axis

and a minor axis such that when said expanded metal filter layers are stacked, said major axis of one of said expanded metal filter layers is perpendicular to the major axis of the next adjacent expanded metal filter layer; and

wherein at least one of said filter matrices has at least one filter screen layer, said at least one filter screen layer being flat and contiguous to one of said expanded metal filter layers and having a plurality of pre-determined apertures defined therein arranged in an array for the passage of cooking smoke therethrough, and wherein each of said apertures is diamond shaped; and

a casing for slidably receiving said at least one filter matrix.

- [25] A filter matrix structure as claimed in claim 24, wherein said casing is provided with at least one channel positioned to receive said at least one filter matrix.
- [26] A filter matrix structure as claimed in claim 24, wherein said casing is provided with a slot for slidably receiving said at least one filter matrix.
- [27] A filter matrix structure as claimed in claim 24, wherein said casing is provided with at least one drain hole.
- [28] A filter matrix structure substantially overlying cooking equipment at a selective distance therefrom for reducing volatile particulate matter and organic compounds in cooking smoke, said filter matrix structure comprising:
  - at least two filter matrices hingedly mounted to one another, said filter matrices having:
    - a stack of at least two expanded metal filter layers, each of said expanded metal filter layers having a plurality of predetermined apertures defined therein arranged in an array for the passage of cooking smoke therethrough;
    - wherein each of said apertures in each of said expanded metal filter layers is diamond-shaped defined by four walls which are inclined at an angle to a plane defined by the expanded metal filter layers; and
    - wherein each of said expanded metal filter layers has a major axis and a minor axis such that when said expanded metal filter layers are stacked, said major axis of one of said expanded metal filter layers is perpendicular to the major axis of the next adjacent expanded metal filter layer.
- [29] The filter matrix structure as claimed in claim 28, wherein said four walls defining each of said apertures in each of said expanded metal filter layers is inclined at an angle between 30 to 70 degrees.
- [30] The filter matrix according to claim 28, wherein said expanded metal filter layer is manufactured from materials chosen from the group of materials consisting of iron, chromium, aluminum, yttrium, zirconium, titanium dioxide and com-

binations and mixtures thereof.

- [31] The filter matrix according to claim 28, wherein said expanded metal filter layer has a catalytic coating thereon.
- [32] The filter matrix according to claim 35, wherein said catalytic coating is a precious metal catalyst.
- [33] The filter matrix according to claim 35 wherein said catalytic coating is titanium dioxide.
- [34] The filter matrix according to claim 28, wherein said expanded metal filter layer has an electropolished surface.
- [35] The filter matrix according to claim 28, wherein said expanded metal filter layer has a non-stick coating .
- [36] The filter matrix structure as claimed in claim 28, wherein each of said expanded metal filter layers has a porosity of between 30% and 50%.
- [37] The filter matrix structure as claimed in claim 28, wherein each of said expanded metal filter layers has a porosity of between 40% and 55%.
- [38] The filter matrix structure as claimed in claim 28, wherein each of said expanded metal filter layers has a porosity of 42%.
- [39] A filter matrix substantially overlying a broiler at a selective distance therefrom for reducing volatile particulate matter and organic compounds in broiler smoke, said filter matrix comprising:  
 at least one filter screen layer horizontally disposed above the broiler for arresting the broiler flame; and  
 a stack of at least two expanded metal filter layers, the first of which is contiguous to said filter screen layer which is directly above the broiler;  
 wherein each of said at least one filter screen layer is flat and has a plurality of pre-determined apertures defined therein arranged in an array for the passage of broiler smoke therethrough and wherein each of said apertures is diamond shaped;  
 wherein each of said expanded metal filter layers has a plurality of pre-determined apertures defined therein arranged in an array for the passage of broiler smoke therethrough,  
 wherein each of said apertures in each of said expanded metal filter layers is diamond-shaped defined by four walls which are inclined at an angle: and  
 wherein each of said expanded metal filter layers has a major axis and a minor axis such that when said expanded metal filter layers are stacked, said major axis of one of said expanded metal filter layers is perpendicular to the major axis of the next adjacent expanded metal filter layer:  
 whereby when the broiler smoke is passing through said filter matrix, the pathway of the broiler smoke is labyrinthine.
- [40] The filter matrix according to claim 39, wherein said four walls defining each of

said apertures in each of said expanded metal filter layers is inclined at an angle between 30 to 70 degrees.

- [41] The filter matrix according to claim 39, wherein said filter screen layer is manufactured from steel.
- [42] The filter matrix according to claim 39, wherein said expanded metal filter layer is manufactured from materials chosen from the group of materials consisting of iron, chromium, aluminum, yttrium, zirconium, titanium oxide and combinations and mixtures thereof.
- [43] The filter matrix according to claim 39, wherein said filter screen layer has a catalytic coating thereon.
- [44] The filter matrix according to claim 43, wherein said catalytic coating is a precious metal catalyst.
- [45] The filter matrix according to claim 43, wherein said catalytic coating is titanium dioxide.
- [46] The filter matrix according to claim 39, wherein said filter screen layer has a non-stick coating .
- [47] The filter matrix according to claim 39, wherein said expanded metal filter layer has a catalytic coating thereon.
- [48] The filter matrix according to claim 46, wherein said catalytic coating is a precious metal catalyst.
- [49] The filter matrix according to claim 46, wherein said catalytic coating is titanium dioxide.
- [50] The filter matrix according to claim 39, wherein said expanded metal filter layer has a non-stick coating .
- [51] The filter matrix according to claim 39, wherein each of said filter screen layers has a porosity between 50% and 70% .
- [52] The filter matrix according to claim 39, wherein each of said filter screen layers has a porosity between 60% and 65% .
- [53] The filter matrix according to claim 39, wherein each of said filter screen layers has a porosity of 62% .
- [54] The filter matrix according to claim 39, wherein each of said expanded metal filter layers has a porosity of between 30% and 50%.
- [55] The filter matrix according to claim 39, wherein each of said expanded metal filter layers has a porosity of between 40% and 55%.
- [56] The filter matrix according to claim 39, wherein each of said expanded metal filter layers has a porosity of 42%.
- [57] The filter matrix according to claim 39, wherein said filter matrix functions from a range of 150°F to 1100°F at a ventilation rate of 50 to 3600 feet per minute.
- [58] The filter matrix according to claim 39, wherein a stack of at least two expanded metal filter layers is sandwiched between two said filter screen layers.

- [59] The filter matrix according to claim 39, wherein said filter matrix is mounted in a frame.